NTWC
National Tribal Water Center

Photo credit Jeremy Wade Shockley @Fedora Photo

Findings from Project Coyote Water: An Assessment of Unregulated Water Sources on Tribal Lands within the United States

National Tribal Water Center

NTWC | July 28, 2016

Executive Summary

Objectives: Project Coyote Water is a collaboration between the National Tribal Water Center (NTWC) and the Center for Disease Control's Health Studies Branch (CDC-HSB). The primary objectives of this project were to:

- collect background information on tribal household use and treatment of unregulated water sources, including private wells, springs, or watering points which are not served by public water systems; and
- assess private well testing and community educational programs and common water utility practices.

Methods: Questionnaire data was primarily collected through in-person interviews, with a small number (nine) administered by telephone. Both in-person and telephone interviews were conducted by the same NTWC employee trained in the use of data collection through survey responses.

Results: Forty-four representatives from the 12 Indian Health Service (IHS) areas completed the survey, with 26 tribal organizations and 18 IHS providers participating. While 95% of all participants reported some use of unregulated water for drinking and/or household activities in their area, the largest proportions of respondents using an unregulated water source for at least half or more of their water consumption and household activities are in the Bemidji (27%), Oklahoma (27%), and Nashville (18%) areas. Of the unregulated water sources, private well water (95%), water from springs (36%), and surface water (33%) were the most commonly consumed. Motivations for unregulated water source consumption include cost (35%), culture or tradition (35%), and trust or perception of the water quality (57%), with multiple answers possible. Additionally, 59% of the respondents stated that communities are "concerned" or "very concerned" about water contamination in their area. Of all the respondents reporting households in their area using more than half of their water from unregulated water sources, the most commonly identified contaminants include bacteria (75%), natural pollution (66%), nitrates (66%), arsenic (61%) and sediment (59%). Sixty percent of IHS and tribal organizations report that well-testing programs are offered in their areas.

Conclusions: This information will allow the CDC and NTWC to design a strategic plan to help address these public health concerns, develop targeted interventions, and allocate resources to reduce the health risks of consuming and using unregulated water sources on tribal lands.

Introduction (A little information about the project)

The Alaska Native Tribal Health Consortium (ANTHC) is home to the National Tribal Water Center (NTWC). At NTWC, we recognize that the maximum health benefit of water and sanitation is achieved when water and sanitation services are available, accessible, and adequate. We work to identify deficiencies and develop tools to ensure that water and sanitation services are safe, properly operated, and inspire the confidence of the community. Numerous studies have been published that show connections between contaminated drinking water and increased risk of disease. To ensure the quality of public drinking water, Congress passed the Safe Drinking Water Act of 1974. However, the act only covers public community water systems. Private wells and surface water sources such as lakes and streams that are self-hauled to the home for drinking are not covered by the act. This means that there is no federal law requiring these sources be tested, and that the responsibility of testing falls on the individual.

KNOWLEDGE DROPS

- About 11 percent of Americans use well water as their primary source of drinking water[1].
- Individuals who rely on private wells are often located outside of areas with water distribution systems[2] and providing public utilities to their homes is neither reasonable nor cost effective.
- In the United States, safe drinking water and sanitary sewage disposal are unavailable in 13 percent of AI/AN homes on reservations, compared with one percent for the overall United States population[3]
- An estimated 30,000 AI/AN homes are without drinkable water[4].

[1] U.S. Census Bureau (2015). 2013 American Housing Survey Factsheets. Retrieved March 24, 2016, from http://www.census.gov/programs-surveys/ahs/
[2] U.S. Census Bureau (2016). American Housing Survey for the United States: 2016. Retrieved March 22, 2016, from http://www.census.gov/programs-surveys/ahs/
[3] U.S. National Library of Medicine (2009). Native Voices. Retrieved March 25, 2016 from https://www.nlm.nih.gov/nativevoices/timeline/616.html
[4] U.S. Department of Health and Human Services, Indian Health Service, Office of Public Health Support, Division of Program Statistics (2014). Trends in Indian Health: 2014 Edition. Retrieved from https://www.ihs.gov/dps/index.cfm/publications/trends2014/ 03/25/2016

In order to gather more complete information about use of unregulated water sources on tribal lands, NTWC, with assistance from the Center for Disease Control and Prevention's Health Studies Branch (CDC-HSB), conducted Project Coyote Water. The primary objectives of this project were to:

- collect background information on tribal household use and treatment of unregulated water sources, including private wells, springs, or watering points which are not served by public water systems; and
- assess private well testing, community educational programs and common water utility practices.

Unregulated water use data was collected using a short two-part survey. The first part of the survey was designed to collect information regarding how many households rely on unregulated water sources, tribal water quality concerns, water education programs, and water testing practices. The second part of the survey was designed to collect specific details about the unregulated water source data that exists on tribal lands.

In addition to the questions about unregulated water use, this survey also investigated water utility practices. The information collected regarding the water utility practices can be found in Appendix A.

Photo credit Jeremy Wade Shockley @Fedora Photo

Materials and Methods (What we did and how we did it)

Participant Recruitment

The NTWC, with assistance from CDC-HSB, surveyed staff from tribal environmental programs and Indian Health Service (IHS) environmental health services employees. For each of the 12 IHS regions, at least one IHS staff member from an area, regional or district office and at least one tribal environmental program staff member was interviewed.

Survey Administration

From January 2015 to March 2016, we administered the two part survey to participants. Most surveys were collected through in-person interviews, although nine surveys had to be completed by telephone because of scheduling or travel conflicts. Both in-person and telephone interviews were conducted by the same NTWC employee who had been trained in use of the data collection tool. Responses were recorded onto a paper form and later entered into an electronic database. Double data entry was conducted to assure data quality. For the complete analysis, please see Appendix B-G.

Photo credit Jeremy Wade Shockley @Fedora Photo

Results (What we found)

A total of 44 participants from 26 tribal environmental programs and 18 IHS offices were interviewed (Figure 1). At least one IHS participant and one Tribal participant were interviewed in each IHS regional area. Seven areas had participants from more than one tribal organization participate.

Figure 1. Number (n) of Interviews by IHS Regional Area

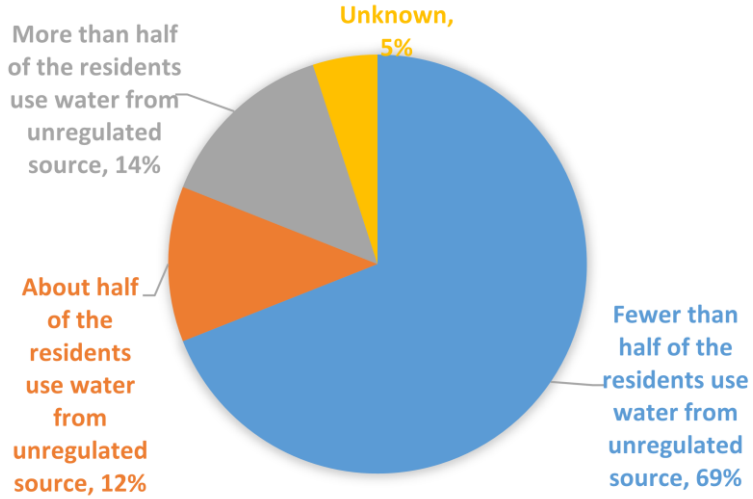
Do American Indians and Alaska Natives use water from unregulated water sources for household purposes?

Our survey found that 95% of participants reported some use of unregulated water for drinking and/or household activities in their area (Figure 2). In those areas where unregulated water is used:

- 69% estimated that fewer than half of households regularly use unregulated water.
- 14% estimated that more than half of households regularly use unregulated water.
- Of the areas with unregulated water source being used for half or more of their water activities, the highest percentages were found in the Bemidji (27%), Oklahoma (27%), and Nashville (18%) areas.

Participants indicated that these estimates were based on actual data (84%), professional experience (32%), or did not specify how they came to their estimate (14%) (multiple sources could be identified by the participant).

Figure 2. Tribal Household Use of Unregulated Water



Do people drink or cook with water from unregulated sources even when water from a regulated source is available?

Yes, our results indicate that 57% of the participants who reported unregulated water use also reported that some households in their regions did drink water from unregulated water sources or use it for cooking even when regulated water was available. However, 69% indicated that it was uncommon or very uncommon.

Of those participants who reported household preference of water from an unregulated source, the common reasons include:

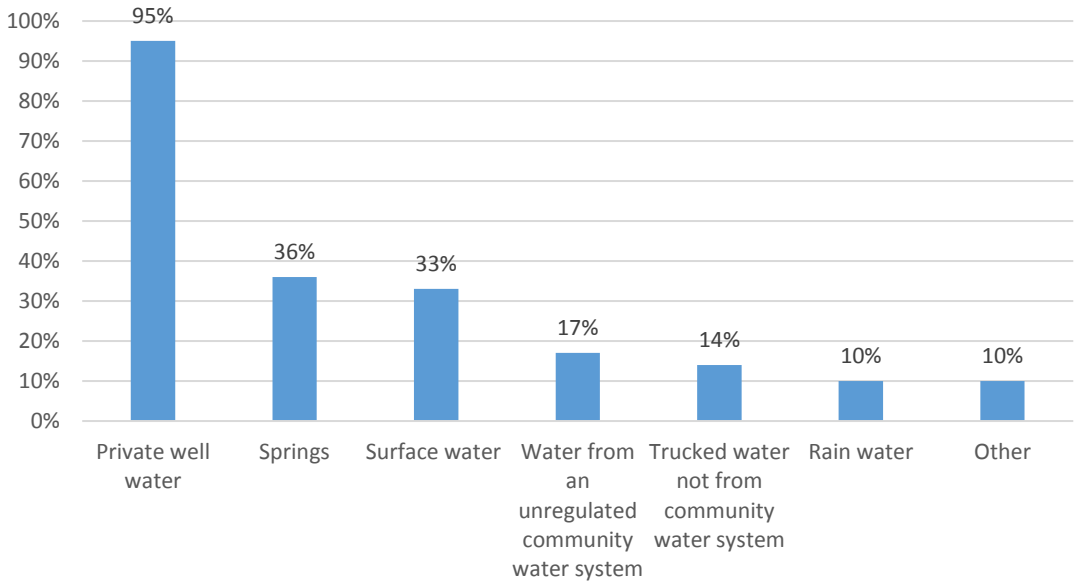
- Trust/perception of water quality (this includes mistrust of water from a community water system) (57%)
- Cultural traditions/use of water for ceremonial purposes (35%)
- Cost of community water (35%)

Multiple reasons could be identified by the participant.

Where does the unregulated water come from?

Private wells were the most common source of unregulated water used for drinking and cooking, reported by 95% of participants. Other unregulated sources identified include springs, surface water, rainwater, water hauled in from outside the community, and water from unregulated community systems (Figure 3).

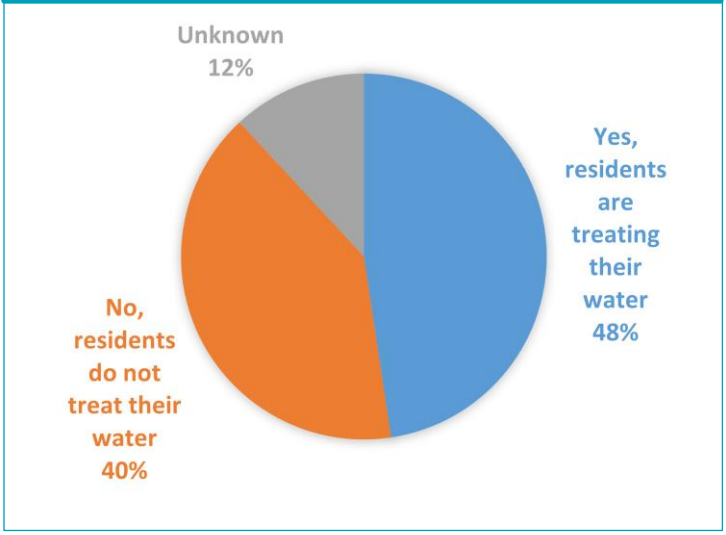
Figure 3. Percentages of Common Unregulated Water Sources Used for Drinking/Cooking



Additionally, in some rural areas with limited water resources, 19% of the total participants reported household use of agricultural well water for drinking or cooking. However, agricultural wells were not used or not present in 69% of the participant's areas.

Is the unregulated water being treated?

Figure 4. Percentage of Residents that Treat Unregulated Water Prior to Drinking



Forty-eight percent of the survey participants that reported that households in their area used unregulated water sources also reported that households treated the water in some way prior to drinking.

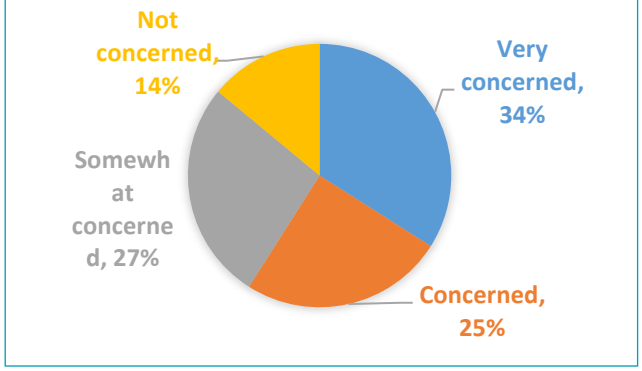
Of the 48% of the participants that identified household treatment of unregulated water, point-of-use filtration (including sand filters, ceramic filters, etc. installed in the home) was the most common treatment method used. The following methods were reported:

- Point-of-use filtration (85%)
- Point-of-entry filtration (45%)
- Other methods (40%)

Multiple water treatment methods could be identified by the participant.

How concerned are communities about water contamination?

Figure 5. Community concern of water contamination

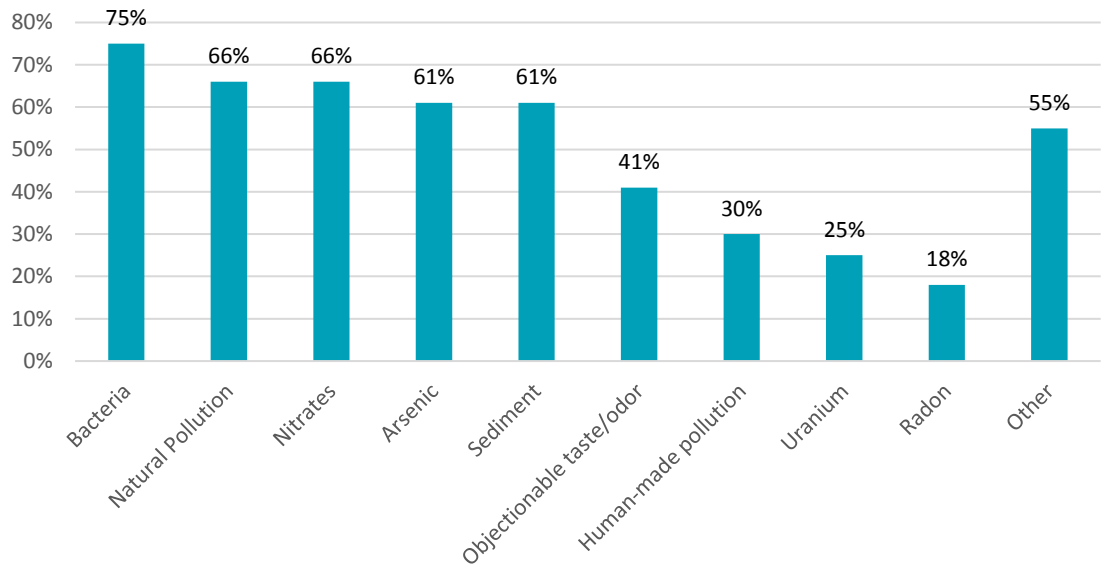


Eighty- six percent of the survey participants reported that community members felt some level of concern regarding water contamination. When asked how concerned they felt community members are about water contamination issues, 34% of participants reported that they felt community members were very concerned, 25% concerned, 27% somewhat concerned, and 14% not concerned.

What contaminants were commonly identified as present in the unregulated water sources?

Bacteria, nitrates, and natural pollution (e.g. animal pollution) were the most commonly identified water contaminants reported. The following graph shows the percentage of participants who identified the contaminants listed in Figure 6 to be commonly present in their area (multiple contaminants could be identified by the participant).

Figure 6. Water Contaminants Commonly Identified in Unregulated Water Sources



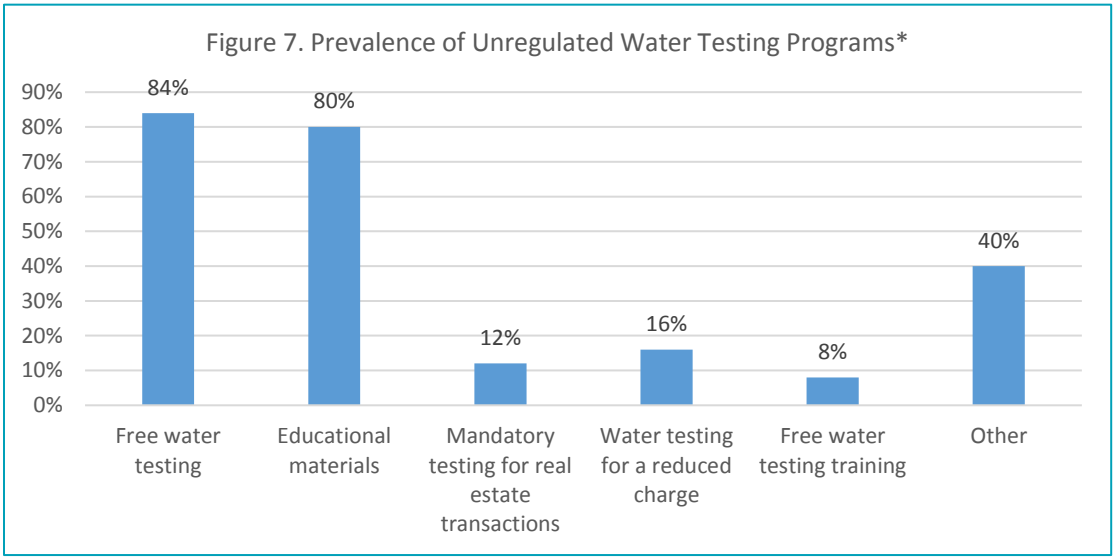
Are the unregulated water sources being tested?

Of the 95% of survey participants that indicated the household use of water from unregulated sources, most participants (69%) reported that fewer than half of households in their area with private wells had tested their wells in the last five years. However, 60% of participants reported that some type of program to promote local well testing was offered in their area.

Photo credit Jeremy Wade Shockley @Fedora Photo

What type of water testing services do the local programs provide?

Of the 60% of participants reporting the presence of a local well testing program, 84% indicated that there were programs in their area that would test the water for free, and 80% knew of programs that provided educational material on water testing (Figure 7).



*Testing of unregulated water sources is often conducted on a case-by-case basis when requests are made by concerned households. During the conversation, some program representatives mentioned that they were testing the wells despite the lack of dedicated funding.

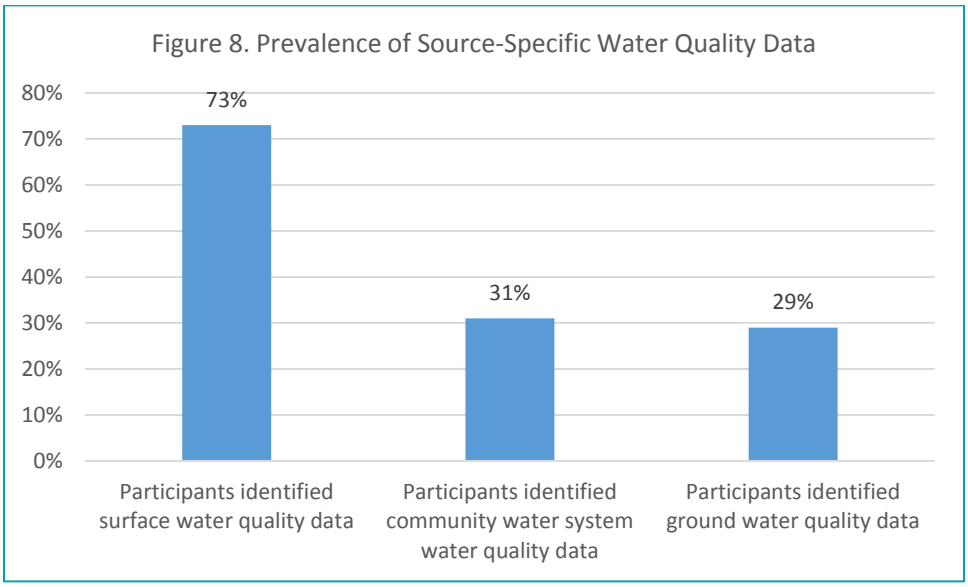
Are water quality education activities are offered?

The majority of participants (77%), reported that educational activities about water contaminants were offered in their respective areas. Among these 77% of participants, the types of outreach reported include:

- Educational materials (65%)
- Community engagement (i.e. health fairs, community meetings, and radio programs) (32%)
- Technical assistance/training (i.e. extension office and IHS consultation) (29%)

What water quality data exists?

Seventy-three percent (73%) of the survey participants provided information on water quality data from ground water, surface water (31%), and community water systems (29%). For specific data type parameters see Appendix B.



Multiple options could be identified by the participant.

Next Steps

The two main objectives of Project Coyote Water were to: 1) collect background information on tribal household use and treatment of unregulated water sources, including private wells, springs, or watering points which are not served by public water systems; and 2) assess private well testing and community educational programs and common water utility practices.

The data gathered points to a need for water testing on tribal lands in order to better characterize the unregulated water being used. This project found that the majority of survey participants reported that some households in their areas use water from unregulated sources for daily household activities. Additionally, fewer than half of the households in their area using private wells have had the wells tested in the last five years. This finding is especially important since more than one in five sampled wells in the United States contain one or more contaminants at a concentration greater than an Environmental Protection Agency maximum contaminant level or other human-health benchmarks (DeSimone & Gilliom, 2009). It is crucial to test these water sources to understand the potential risks of drinking water from these unregulated water sources.

Project Coyote Water also gathered data regarding the perceptions and concerns of tribes about their water sources and compiled an inventory of existing unregulated water source

monitoring data for each of the participating areas. This information will allow the CDC and NTWC to design a strategic plan to help address these public health concerns, develop targeted interventions, and allocate resources to reduce the health risks of consuming and using contaminated unregulated water systems on tribal lands.

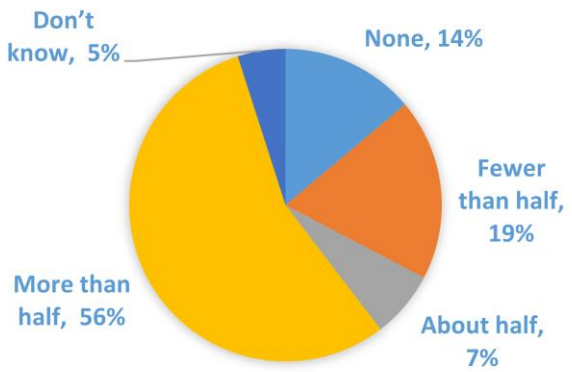
Recommendations for future work include gathering more information to identify tribes at risk from exposure to contaminated unregulated water sources. This study relied on a small, convenient sample of tribal organizations and IHS providers (44 participants) serving the 566 federally recognized tribes across the United States. The information provided through this project was self-reported and may have a response bias. To address this limitation the CDC and NTWC plan to further this project by disseminating the survey electronically in order to reach a greater number of tribes across the United States.

The NTWC and the CDC HSB extend a heartfelt thank you to all of the tribes and IHS offices that participated in this project. Without your help and participation, this project would not have been possible.

Appendix A. Water utility practices

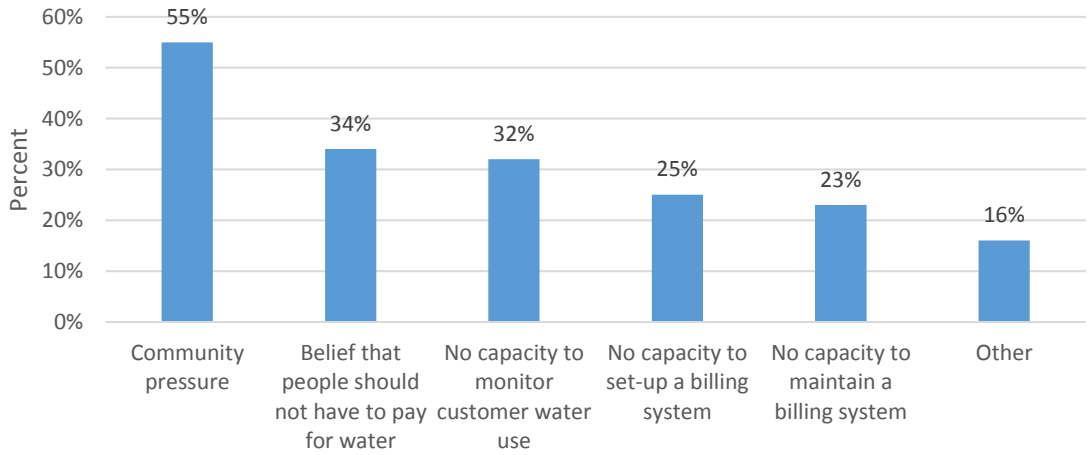
Fifty-six percent of survey participants reported that more than half of water utility companies in their respective areas had fee-based services while only 14% of survey participants reported that no utilities in their area charged for water (Figure 9).

Figure 9. Percent of water utilities in areas with fee-based services



For utilities not charging for water, community pressure was the most common reason mentioned by survey participants for utilities to not establish a fee (55%). Belief that people should not have to pay for water (34%) and no capacity to monitor customer water use (32%) were other commonly reported reasons for utilities not establishing a fee (Figure 10).

Figure 10. Reasons for Water Utility Not Establishing a Fee

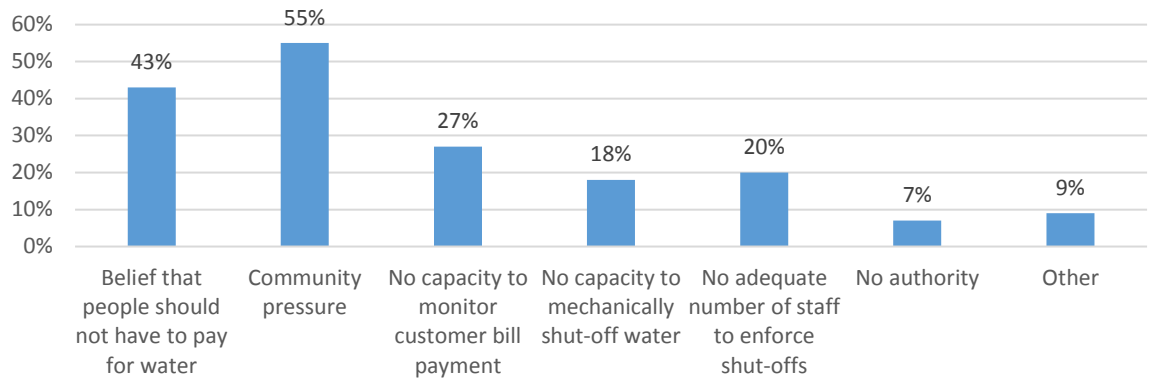


Other includes: Casino or other entity pays (n=4), People cannot afford to pay (n=1), Traditional or Cultural Belief that selling water will cause springs to dry up (n=1), jurisdictional issues between city and tribe (n=1)

For utilities that charged fees, participants reported that more than half of the utilities in their area enforced fee collection (57%). Water shut-offs (77%) followed by fines (23%) were the most frequently reported means of fee collection enforcement.

The two most common reasons identified by participants for not enforcing fee collection, community pressure (55%) and the belief that people should not have to pay for water (43%), similar to the reasons provided for not establishing a fee (Figure 11).

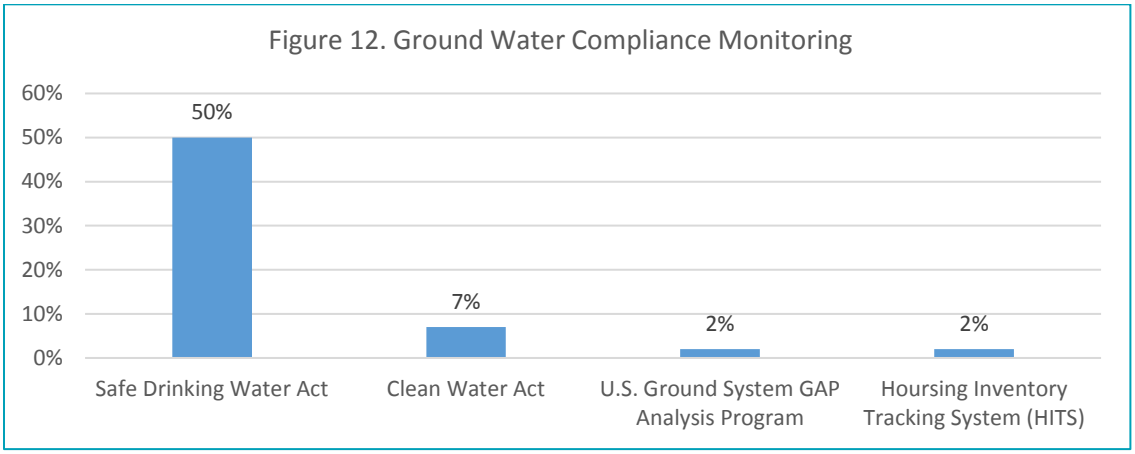
Figure 11. Reasons for Utilities to Not Enforce Fee Collection



Sum may be more than 100 because multiple options can be selected.

Appendix B. Water Quality Monitoring

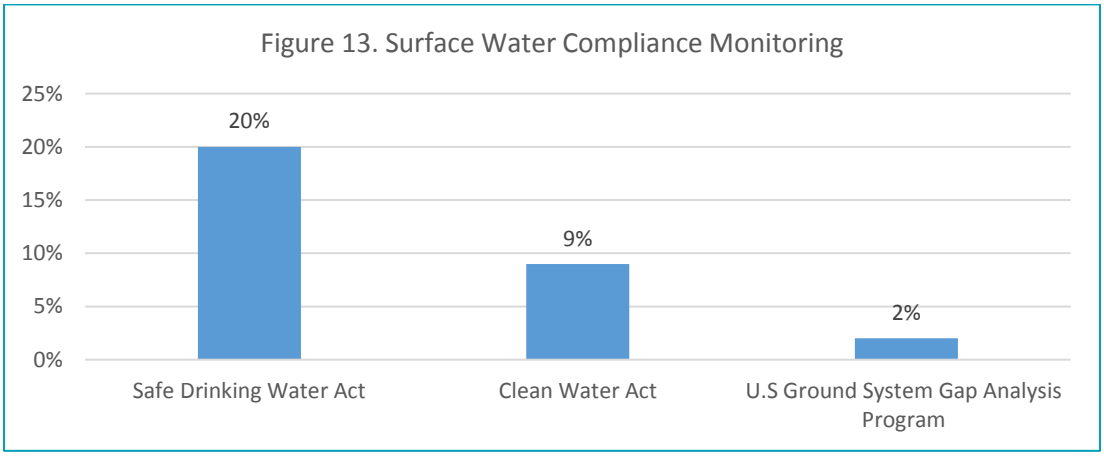
Of those 73% of survey participants who provided information on water quality data from ground water, participants collected water quality data in accordance with the Safe Drinking Water Act (SDWA), Clean Water Act, U.S. Ground System Gap Analysis Program, or Housing Inventory Tracking System (HITS) (Figure 12)



Data collected in accordance with the SDWA includes information on:

- microorganisms,
- disinfectants,
- disinfection byproducts,
- inorganic chemicals,
- organic chemicals, and
- radionuclides

For surface water information, data collected in accordance with the SDWA, Clean Water Act (CWA), and U.S. Ground System Gap Analysis Program (GAP) (Figure 13).



Appendix C. Unregulated Water Use on Tribal Lands – Survey

NTWC
National Tribal Water Center
Project Coyote Water

Interviewee:_____
Interviewer: _____
Date of Interview:_____

Unregulated Water Use on Tribal Lands - Survey

Unregulated water sources are those not protected by or regulated under the Safe Drinking Water Act, including private wells, surface water, and small water systems serving less than 25 people or having less than 15 connections. This definition should be considered while answering the following questions. To better understand the use of unregulated water sources on Tribal lands, we would like to ask you a few questions based on your experiences working in this area. These questions should only take about 15 minutes of your time and all responses will be kept confidential.

1) **Based on your experience, do households in your (Area, District, Service Unit, Community) use unregulated water sources for household activities (e.g., bathing, laundry, dish washing, drinking, etc.)?**
   - ☐ Yes
   - ☐ No *If no, skip to question 10.*
   - ☐ Don't know

2) **Out of all the households in your (Area, District, Service Unit, Community) how many would you say use unregulated water for household activities (e.g. bathing, laundry, dish washing, etc.)?**
   - ☐ Fewer than half
   - ☐ About half
   - ☐ More than half
   - ☐ Don't know

   a) **What are these estimates based on?**_____
   _____
   _____

3) **In your experience, out of all the households in the (Area, District, Service Unit, Community) how many consume unregulated water (e.g. through cooking or drinking) on a regular basis?**
   - ☐ Fewer than half
   - ☐ About half
   - ☐ More than half
   - ☐ Don't know

4) **In your experience, do people use unregulated water for drinking or cooking even when they have access to regulated water from a community water system?**
   - ☐ Yes
   - ☐ No *If no, skip to question 5.*
   - ☐ Don't know

a) **If yes, do you have a sense of how common this is?**

- ☐ Very common
- ☐ Somewhat common
- ☐ Common
- ☐ Uncommon
- ☐ Very uncommon
- ☐ Don't know

b) **If yes, why do you think people use unregulated water for drinking or cooking instead of water from a community water system?**_____

5) **Of those households using unregulated water, in your experience, do residents treat (e.g. boiling, filtering, chlorination) the unregulated water prior to drinking?**

- ☐ Yes
- ☐ No *If no, skip to question 6.*
- ☐ Don't know

a) **For households in which residents treat unregulated water prior to drinking, which methods are used?** (Check all that apply)

- ☐ Treat with point-of-use filtration device (treats water from the tap or refrigerator)
- ☐ Treat with point-of-entry filter (treats all water coming into the home)
- ☐ Treat by boiling
- ☐ Treat by distillation
- ☐ Treat by other method
- ☐ Specify method:_____
- ☐ Don't know

6) **In your experience, what are common sources of unregulated water used for drinking or cooking in the (Area, District, Service Unit, Community)?** (Check all that apply)

- ☐ Rain water
- ☐ Surface water (e.g. lake, pond, river)
- ☐ Private well water
- ☐ Trucked water not from community water system
- ☐ Water from an unregulated community water system (≤25 people or <15 connections)
- ☐ Other:_____

7) **In some rural areas with limited water resources, water from agricultural wells is available. In your experience, do people use water from agricultural wells for drinking or cooking in the (Area, District, Service Unit, Community)?**

- ☐ Yes
- ☐ No, agricultural wells are not used in this area
- ☐ No, agricultural wells are not present in this area
- ☐ Don't know

8) **In your experience, about how many of the households with private wells in your (Area, District, Service Unit, Community) have tested their well water in the past 5 years?**

- ☐ Fewer than half
- ☐ About half
- ☐ More than half
- ☐ Don't know

9) **Are there local programs to promote well testing in your (Area, District, Service Unit, Community)?**

- ☐ Yes
- ☐ No *If no, skip to question 10.*
- ☐ Don't know

a) **If yes, what kind of programs? (Check all that apply)**

- ☐ Providing educational materials
- ☐ Providing free water testing
- ☐ Providing water testing for a reduced charge
- ☐ Providing free water testing training
- ☐ Providing water testing training for a reduced charge
- ☐ Mandatory well testing for real estate transactions
- ☐ Other:_____

10) [Interviewer shows the Interviewee a list of possible water contaminants] Looking at this list of contaminants, are any of these present in any unregulated water sources in your (Area, District, Service Unit, Community)? (Check all that apply)

a) Arsenic
- ☐ Yes
- ☐ No
- ☐ Don't know

b) Uranium
- ☐ Yes
- ☐ No
- ☐ Don't know

c) Nitrates
- ☐ Yes
- ☐ No
- ☐ Don't know

d) Radon
- ☐ Yes
- ☐ No
- ☐ Don't know

e) Bacteria
- ☐ Yes
- ☐ No
- ☐ Don't know

f) Sediment
- ☐ Yes
- ☐ No
- ☐ Don't know

g) Natural pollution (e.g., animals use water)
- ☐ Yes
- ☐ No
- ☐ Don't know

h) Manmade pollution (e.g., power plant discharge)
- ☐ Yes
- ☐ No
- ☐ Don't know

i) Objectionable taste or odor (e.g., "rotten egg" odor)
- ☐ Yes
- ☐ No
- ☐ Don't know

j) Other:_____
_____
_____

If no for all contaminants listed, skip to question 13.

11) How concerned do you think community members are about water contamination issues?
- ☐ Very concerned
- ☐ Concerned
- ☐ Somewhat concerned
- ☐ Not concerned
- ☐ Don't know

12) Are you aware of any educational outreach activities around water contamination issues in the (Area, District, Service Unit, Community)?

- ☐ Yes
- ☐ No
- ☐ Don't know

a) If yes, what kind of educational outreach activities exist?_____

_____

_____

_____

13) In your experience, about how many of the water utilities in your (Area, District, Service Unit, Community) charge residents for their water?

- ☐ None of the utilities have established a fee
- ☐ Fewer than half
- ☐ About half
- ☐ More than half
- ☐ Don't know

14) For water utilities that have not established a fee, what are the primary reasons? (Check all that apply)

- ☐ People should not have to pay for water
- ☐ The utilities do not have the capacity to set-up a billing system
- ☐ The utilities do not have the capacity to maintain a billing system
- ☐ The utilities do not have a way to monitor water use by customers
- ☐ There is community pressure to not charge residents for water
- ☐ Other:_____

If no water utilities have established a fee, skip to question 17.

15) Of water utilities that have established a fee for water, about how many of the utilities enforce fee collection?

- ☐ Fewer than half
- ☐ About half
- ☐ More than half
- ☐ Don't know

16) Of those water utilities that enforce fee collection, what means of enforcement do they use?

- ☐ Water shut-offs
- ☐ Fines
- ☐ Other:_____

17) In your experience, for water utilities that do not enforce fee collection, what are the main reasons? (Check all that apply)

- ☐ A belief that people should not have to pay for water
- ☐ The utilities do not have the adequate number of staff to enforce shut-offs
- ☐ There is community pressure to not shut-off residents
- ☐ The utilities do not have a way to monitor bill payment by customers
- ☐ Mechanically, the household water service cannot be shut-off
- ☐ Other:_____

18) [Interviewer will inquire about water quality databases, their location and who manages the data]

Water Source	Data Type/Parameters	Data Time Span	Geographic Location of Water Tested	Data Manager Contact Information (name, phone #, email, organization)

Appendix D. Data Analysis

Data collected from the questionnaires were entered into an Epi Info 7 database (Epi Info version 7.1.3.10, CDC, 2012). Variables of interest included: participant organization type (tribal, IHS); percent of households on tribal lands using UDWS for household activities or drinking (<50%, about 50%, >50%, don't know); use of UDWS when water from a community water system is available (yes, no, don't know); treatment of UDWS prior to drinking (point-of-use filters, point-of-entry filters, boiling, distillation, other method, don't know); common sources of UDWS (rain water, surface water, private wells, trucked water not from a community water system, water from an unregulated community water system, other); percent of households that tested their private well within the past 5 years (<50%, about 50%, <50%, don't know); local programs to promote well testing (educational materials, free water testing, water testing for a reduced charge, free water testing training, water testing training for a reduced charge, mandatory well testing for real estate transactions); contaminants present in UDWS (arsenic, uranium, nitrates, radon, bacteria, sediment, natural pollution, manmade pollution, objectionable taste/odor, other); and community member concern with water contamination (very concerned, concerned, somewhat concerned, not concerned, don't know). Descriptive statistics were generated in Epi Info 7. Data were also stratified by participant organization type, with Chi-square test (or Fisher's Exact test for ≤5 observations) used to assess statistical significance of differences between expected and observed frequencies. Statistical significance was defined as $p \leq .05$.

Appendix E.

Table 2. Reported household use and treatment of unregulated water sources on tribal lands, overall and by participant affiliation – Project Coyote Water, 2015-2016

	Total	Tribal Organization	Indian Health Service	*p* value[a]
Variable	N (%)	n (%)	n (%)	
Household use of unregulated water source for household activities	44	26	18	0.51
Yes	42 (95)	24 (92)	18 (100)	
No	2 (5)	2 (8)	0	
Don't know	0	0	0	
Estimated percent of households using unregulated water source for household activities[b]	42	24	18	0.24
Fewer than half	29 (69)	19 (79)	10 (56)	
About half	5 (12)	2 (8)	3 (17)	
More than half	6 (14)	3 (13)	3 (17)	
Don't know	2 (5)	0	2 (11)	
Estimated unregulated water source use based on[c]	37	22	15	
Data	31 (84)	21 (95)	10 (67)	0.07
Professional Experience	12 (32)	6 (27)	6 (40)	0.45
Not Specified	5 (14)	2 (9)	3 (20)	0.39
Estimated percent of households regularly consuming unregulated water source	42	24	18	0.34
Fewer than half	29 (69)	19 (79)	10 (56)	
About half	5 (12)	2 (8)	3 (17)	
More than half	5 (12)	3 (13)	2 (11)	
Don't know	3 (7)	0	3 (17)	
Household consumption of unregulated water source when regulated water is available	42	24	18	0.29
Yes	24 (57)	15 (63)	9 (50)	
No	16 (38)	7 (29)	9 (50)	
Don't Know	2 (5)	2 (8)	0	

Frequency of unregulated water source use instead of regulated water	23	14	9	0.64
Very common	2 (9)	2 (14)	0	
Somewhat common	3 (13)	2 (14)	1 (11)	
Common	2 (9)	1 (7)	1 (11)	
Uncommon	9 (39)	6 (43)	3 (33)	
Very uncommon	7 (30)	3 (21)	4 (44)	
Don't know	0	0	0	
Reasons for unregulated water source use[c]	23	14	9	
Cost	8 (35)	6 (43)	2 (22)	0.44
Culture/Tradition	8 (35)	4 (29)	4 (44)	0.69
Trust/Perception of water quality	13 (57)	7 (50)	6 (67)	0.74
Is unregulated water source treated prior to drinking?	42	24	18	0.25
Yes	20 (48)	12 (50)	8 (44)	
No	17 (40)	11 (46)	6 (33)	
Don't know	5 (12)	1 (4)	4 (22)	
Treatment methods used[c]	20	12	8	
Point-of-use filtration	17 (85)	12 (100)	5 (63)	0.22
Point-of-entry filter	9 (45)	5 (42)	4 (50)	1
Boiling	5 (25)	2 (17)	3 (38)	0.39
Distillation	0	0	0	
Other method[d]	8 (40)	5 (42)	3 (38)	1
Don't know	2 (10)	0	2 (25)	0.16
Common unregulated water sources for drinking/cooking[c]	42	24	18	
Private well water	40 (95)	23 (96)	17 (94)	0.63
Surface water	14 (33)	8 (33)	6 (33)	0.86
Rain water	4 (10))	2 (8)	2 (11)	1
Trucked water not from community water system	6 (14)	3 (13)	3 (17)	0.68
Water from an unregulated community water system[e]	7 (17)	3 (13)	4 (22)	0.41
Springs	16 (36)	9 (38)	7 (39)	0.77
Other[f]	4 (10)	2 (8)	2 (11)	0.39
Water from agricultural wells used for drinking/cooking	42	24	18	0.23

Yes	8 (19)	6 (25)	2 (11)	
Agriculture wells are not used	19 (45)	9 (38)	10 (56)	
Agriculture wells are not present	9 (21)	7 (29)	2 (11)	
Don't know	6 (14)	2 (8)	4 (22)	

[a] Significance is P< 0.05

[b] Activities include bathing, laundry, dishwashing, etc.

[c] Percentage may sum to more than 100 because multiple options can be selected

[d] Other methods include: individual water chlorination (n=2), sedimentation (n=2), water softening (n=2), aeration (n=1), UV system (n=1)

[e] An unregulated community water system has ≤25 people or <15 connections

[f] Other sources of unregulated water for drinking and cooking: trucked/hauled water from CWS (n=3), cistern (n=1), ice/snow (n=1)

Unregulated Water Source=unregulated water sources; CWS=Community water source

Appendix F:

Table 3. Reported private well testing and community educational programs overall and by tribal organization and Indian Health Service office – Project Coyote Water, 2015-2016

	Total	Tribal Organization	Indian Health Service	*p* value[a]
	N (%)	n (%)	n (%)	
Percent of households with private wells tested in the past 5 years	42	24	18	0.39
Fewer than half	29 (69)	16 (67)	13 (72)	
About half	0	0	0	
More than half	8 (19)	6 (25)	2 (11)	
Don't know	5 (12)	2 (8)	3 (17)	
Local well testing programs offered in the area	42	24	18	0.48
Yes	25 (60)	14 (58)	11 (61)	
No	9 (21)	6 (25)	3 (17)	
Don't Know	6 (14)	2 (8)	4 (22)	
Type of well testing program[b]	25	14	11	
Free water testing	21 (84)	14 (100)	7 (64)	0.33
Educational materials	20 (80)	10 (71)	10 (91)	0.26
Mandatory testing for real estate transactions	3 (12)	1 (7)	2 (18)	0.56
Water testing for a reduced charge	4 (16)	3 (21)	1 (9)	0.63
Free water testing training	2 (8)	0	2 (18)	0.16
Water testing training for a reduced charge	0	0	0	
Other[c]	10 (40)	6 (43)	4 (36)	1
Water contamination educational activities offered in the area	44	26	18	0.03
Yes	34 (77)	19 (73)	15 (83)	
No	8 (18)	7 (27)	1 (6)	
Don't Know	2 (5)	0	2 (11)	
Type of educational outreach activity[b]	34	19	15	
Educational materials	22 (65)	14 (74)	8 (53)	0.54
Community engagement	11 (32)	8 (42)	3 (20)	0.48
Technical assistance/training	10 (29)	3 (16)	7 (47)	0.06

Level of community concern for water contamination	44	26	18	0.88
Very concerned	15 (34)	9 (35)	6 (33)	
Concerned	11 (25)	8 (30)	3 (17)	
Somewhat concerned	12 (27)	7 (27)	5 (28)	
Not concerned	6 (14)	9 (35)	4 (22)	
Presence of contaminants in the area	44	26	18	
Bacteria	33 (75)	21 (81)	12 (67)	0.28
Natural Pollution	29 (66)	19 (73)	10 (18)	0.23
Nitrates	29 (66)	17 (65)	12 (67)	0.93
Arsenic	27 (61)	15 (58)	12 (67)	0.55
Sediment	27 (61)	15 (58)	12 (67)	0.55
Objectionable taste/odor	18 (41)	19 (73)	13 (72)	0.95
Human-made pollution	13 (30)	9 (35)	4 (22)	0.38
Uranium	11 (25)	6 (23)	5 (28)	0.72
Radon	8 (18)	5 (19)	3 (17)	0.83
Other[d]	24 (55)	17 (65)	12 (67)	0.25

[a]Significance is P<0.05

[b]Percentage may sum to more than 100 because multiple options can be selected

[c]Other: N=10 mentioned water sampling but the cost was not specified.

[d]Other includes: Manganese (n=6), Fluoride (n=5), Iron (n=5), Hardness (n=4), Total dissolved solids (n=3), Copper (n=2), Lead (n=2), Radionucleotides (n=2), pH (n=1), Ammonia (n=1), Phosporus (n=1), Methane (n=1), sulfur (n=1), Slime/mold (n=1), Thalium (n=1), Cadmium (n=1)

Appendix G:

Table 4. Reported water utility fees, collection, and enforcement overall and by tribal organization and Indian Health Service office – Project Coyote Water, 2015-2016

	Total	Tribal Organization	Indian Health Service	*p* value[a]
Variable	N (%)	n (%)	n (%)	
Percent of water utilities in area with fee-based services	44	26	18	0.004
None	6 (14)	6 (24)	0	
Fewer than half	8 (19)	3 (12)	5 (28)	
About half	3 (7)	0	3 (17)	
More than half	24 (56)	16 (64)	8 (44)	
Don't know	2 (5)	0	2 (11)	
Reasons for not establishing a fee	44	26	18	
Community pressure	24 (55)	10 (38)	14 (78)	0.01
Belief that people should not have to pay for water	15 (34)	6 (23)	9 (50)	0.11
No capacity to monitor customer water use	14 (32)	5 (19)	9 (50)	0.05
No capacity to set-up a billing system	11 (25)	4 (15)	7 (39)	0.09
No capacity to maintain a billing system	10 (23)	4 (15)	6 (33)	0.27
Other[b]	7 (16)	3 (12)	4 (22)	0.34
Percent of utilities with fee collection enforcement	35	17	18	0.4
Fewer than half	4 (11)	2 (12)	2 (11)	
About half	5 (14)	1 (6)	4 (22)	
More than half	20 (57)	12 (71)	8 (44)	
Don't know	4 (11)	2 (12)	4 (22)	
Means of enforcement[c]	35	17	18	
Water shut-offs	27 (52)	13 (76)	14 (78)	0.11
Fines	8 (4)	7 (41)	1 (6)	0.11
Other[d]	10 (44)	6 (35)	4 (22)	1
Reasons for not enforcing a fee collection[c]	44	26	18	
Belief that people should not have to pay for water	19 (43)	9 (35)	10 (56)	0.17
Community pressure	24 (55)	10 (38)	14 (78)	0.01
No capacity to monitor customer bill payment	12 (27)	1 (4)	11 (61)	<0.001
No capacity to mechanically shut off water	8 (18)	1 (4)	7 (39)	0.005

No adequate number of staff to enforce shut-offs	9 (20)	2 (8)	7 (39)	0.02
No authority	3 (7)	1 (4)	2 (11)	0.56
Other[e]	4 (9)	1 (4)	3 (17)	0.29

[a] Significance is P<0.05 Variables that are statistically significant are highlighted in red

[b] Other includes: Casino or other entity pays (n=4), People cannot afford to pay (n=1), Belief that selling water will cause springs to dry up (n=1), jurisdictional issues between village and tribe (n=1)

[c] Percentage may sum to more than 100 because multiple options can be selected

[d] Other includes: Reconnection fee (n=5), water bill connected with cable bill (n=1), refusal of service (n=1), Housing authority enforcement (n=1), Over use fines (n=1), Membership dues (n=1), Unknown (n=1)

[e] Other: No fee collection (n=3); N=3 individuals who said utilities do not charge chose belief that people should not have to pay (n=2) and community pressure (n=1)